Trend Study 2-13-01

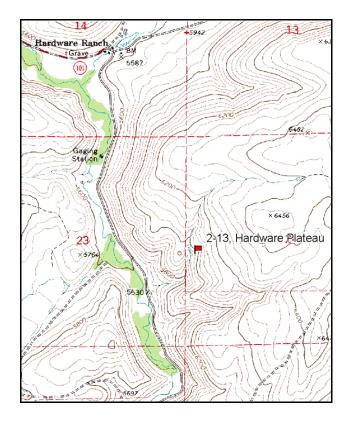
Study site name: <u>Hardware Plateau</u>. Vegetation type: <u>Big Sagebrush</u>.

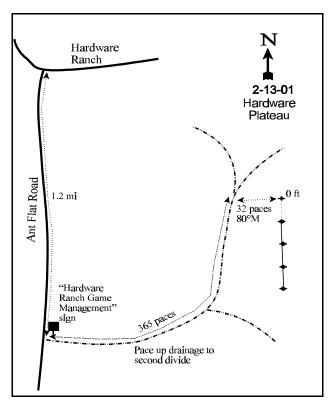
Compass bearing: frequency baseline 163 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Hardware Ranch, proceed south on the Ant Flat road for 1.2 miles. This mileage should end at a sign that reads: "Welcome to Hardware Ranch Game Management Area." Stop here. Walk up the bottom of the wash (to the east of the sign) 365 paces, to the second very definite fork in the drainage. From the point where the wash divides take a bearing of 80 degrees magnetic and walk 32 paces to the 0-foot stake of the baseline, marked by browse tab #7984. The baseline runs at 163 degrees magnetic.





Map Name: <u>Hardware Ranch</u>

Township 10N, Range 3E, Section 24

Diagrammatic Sketch

UTM 4603964 N, 453491 E

DISCUSSION

Trend Study No. 2-13

The <u>Hardware Plateau</u> trend study is located a short distance up one of the small draws at the western edge of the Hardware Plateau. These areas are relatively small in acreage, yet important to wintering deer and elk. The site has a moderately steep (50%), west-facing slope with an elevation of 5,960 feet. The range type is mountain big sagebrush/grass which also contains a scattered mixture of other shrub species. Pellet groups were abundant and two carcasses from the 1983-84 winter were found on the site during study establishment in 1984. Use appeared significantly lighter in 1996 with quadrat frequencies of deer and elk pellet groups at 18% and 7% respectively. One deer was flushed from a drainage near the site and 3 dead deer and 1 dead elk were found near the site in 1996. A pellet group transect read at the site in 2001 estimated 39 deer and 13 elk days use/acre (96 ddu/ha and 32 edu/ha). Yellow bellied marmots are numerous around the larger rock outcrops.

Soils in this area are classed as "Yeates Hollow Extremely Rocky Silt Loam, 30 to 60 Percent Slopes." These are moderately shallow soils where bedrock is normally encountered at about 4 feet in depth. Derived from quartzite and sandstone, the Yeates soil has poor permeability and runoff is normally quite rapid. Roots penetrate to bedrock and soil reaction ranges from neutral to slightly acidic (Erickson and Mortensen, 1974). On the study site, the soil has a loam texture and is very rocky on the surface and through the profile. Due to the rocky nature of the soil, effective rooting depth (see methods) was estimated at about 10 inches with a soil penetrometer. This is obviously an underestimate as deeper rooted shrubs including mountain big sagebrush and antelope bitterbrush are growing on the site, but it gives a relative index of rooting depth. The rocky surface and profile, along with the moderately steep west aspect contribute to a relatively high soil temperature (74° F). Some inevitable soil erosion occurs on the site due to the steep slope, but protective ground cover is abundant and well dispersed. There is little unprotected bare soil and even though there is some rills and active gullies on site, the erosion condition class was determined to be only slight in 2001.

Although the study site is classified as a big sagebrush-grass type, increaser shrubs, including narrowleaf low rabbitbrush, mountain snowberry, woods rose, and Oregon hollygrape are quite numerous and accounted for 62% of the browse cover in 1996 and 64% in 2001. Mountain big sagebrush occurs in low densities. Use was heavy in 1984 and 1990, and percent decadence was extremely high at 70% and 75% respectively. Use was mostly moderate in 1996 and 2001. Percent decadence declined to 21% in 1996 but increased to 50% in 2001. Dead plants, first counted in 1996, numbered more than the live plants (480 dead) indicating a die-off had occurred. The number of dead sagebrush plants are a concern as they outnumber live ones by a ratio of nearly 2 to 1. This kind of loss for sagebrush has been noted on many marginal sites throughout Utah. Because of slope (50%), aspect (west), soils, extended drought, intraspecific competition, and relatively high soil temperatures, some thinning and die-off would be expected for mountain big sagebrush.

Serviceberry and bitterbrush offer additional preferred forage yet these shrubs also occur in relatively low numbers. Serviceberry currently ('01) numbers only 160 plants/acre and produces less than 1% of the shrub cover. Bitterbrush has steadily declined in density from 333 plants/acre in 1984 to only 80 plants/acre in 1996 and 2001. However, some of this change can be explained by the much larger sample size used in 1996 and 2001 which gives a more accurate population estimate for species that characteristically have distributions that are clumped or discontinuous. Use of the bitterbrush has been heavy during all readings. Vigor has been normal even though no seedlings or young plants have been encountered during any reading.

The study area has good grass cover and fair forb cover. Perennial species predominate, however, a few annuals, especially cheatgrass brome, provide a high amount of fine fuel litter when dry. Annual brome grasses accounted for 35% of the grass cover in 1996 and 19% in 2001. The most important perennial grasses include bluebunch wheatgrass and Sandberg bluegrass. These species combined to produce nearly 26% cover, which represents 81% of the grass cover in 2001. Common perennial forbs include Louisiana sagebrush, arrowleaf balsamroot, western yarrow, and silvery lupine. Forbs and grasses show little evidence of any current grazing use and are in good vigor.

1984 APPARENT TREND ASSESSMENT

Considering the extremely rocky and undeveloped nature of this soil, erosion is noticeable. However, the erosion level is probably within acceptable limits. Rock itself is a significant ground cover element with many of the interspaces and rock crevices covered with a light litter cover. Grass and forb cover are fair and probably exceed that of shrubs. Soil trend appears stable or slightly declining. With respect to preferred browse species, trend seems to be declining. Excessive use on the more important browse species is causing their decline and allowing a concurrent increase of less desirable shrubs.

1990 TREND ASSESSMENT

Browse continues to decline on this DWR winter range property which is used by deer, elk, moose, and domestic sheep. Chukars are common. The overall poor vigor and heavy use of the browse is compounded by extended drought and competition with annual grasses and forbs. Together, this is causing low seed production. Even with good seed production, there are not many safe sites for seedling establishment. A majority of the sagebrush, bitterbrush, and serviceberry plants are decadent or already dead. The serviceberry classified as young are sprouts from old root crowns. The samples of these key species are small due to the sparsity of the browse population, but all the data indicate a decline in density. Grasses, mainly bluebunch wheatgrass, Sandberg bluegrass, and cheatgrass are the dominant vegetation. Forbs are also prominent. They have increased slightly. Considering the steep slope, erosion is within acceptable limits due to the good cover values.

TREND ASSESSMENT

soil - stable (3)

browse - down except for slight increase for serviceberry (1)

<u>herbaceous understory</u> - slightly up (4)

1996 TREND ASSESSMENT

Ground cover characteristics have changed somewhat since 1990. Percent rock cover is up from 21% to 25%, and pavement cover increased from 1% to 5%. Litter cover increased slightly although percent bare ground declined from 17% to 7%. Erosion is minimal due to the high proportion of grass and forb cover. Trend for soil is considered slightly up. Key browse species, mountain big sagebrush, appears to have an improving trend. Density is still low at only 280 plants/acre. However, young plants comprise 14% of the population, utilization is more moderate, vigor improved, and percent decadency has declined from 75% to 21%. Bitterbrush has displayed an continual decline in density since 1984, although it only contributes 6% of the browse cover. Population density is currently down to less than 100 plants/acre, but utilization is not as heavy (from 100% down to 50% heavy use) and percent decadence has declined from 50% to 25%. Serviceberry also shows reduced heavy use, improved vigor, and less decadent plants. Overall trend for browse is slightly up but depleted. Trend for the herbaceous understory is down. Sum of nested frequency for perennial grasses are down 23%, while sum of nested frequency of forbs has declined 48%. Nested frequency for the key perennial grass, bluebunch wheatgrass, has declined significantly. Key forbs include western yarrow, arrowleaf balsamroot, sulfur eriogonum, and silvery lupine which have all declined significantly since 1990.

TREND ASSESSMENT

soil - up slightly (4)

browse - slightly improved but in relatively low numbers (4)

herbaceous understory - down (1)

2001 TREND ASSESSMENT

Trend for soil is stable. There is some erosion occurring but this is unavoidable due to the steep slope. There is abundant herbaceous vegetation cover and the erosion condition class was determined to be slight. Trend for browse appears stable but depleted. Mountain big sagebrush currently numbers only 120 plants/acre, half of these being decadent. Use is heavier than 1996 levels but vigor remains good and there are a few young plants in the population. Bitterbrush also shows heavier use than in 1996. There are only an estimated 80 plants/acre. Vigor is normal and percent decadence has remained stable. Trend for the herbaceous understory appears stable with similar sum of nested frequency values for perennial grasses and forbs. Nested frequency of the dominant grass, bluebunch wheatgrass, has remained stable although cover increased from 10% to 18%. Annual cheatgrass declined significantly in nested frequency and cover declined from 10% to 6%.

TREND ASSESSMENT

soil - stable (3)

browse - stable but depleted (3)

herbaceous understory - stable (3)

HERBACEOUS TRENDS --

Herd unit 02, Study no: 13

T y p	Species	Nested	Freque	ncy		Quadra	ıt Frequ	ency		Average Cover %	
e		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
G	Agropyron spicatum	_a 267	_b 305	_a 232	_a 244	94	100	85	84	9.70	17.86
G	Bromus japonicus (a)	-	-	10	14	-	-	5	6	.05	.10
G	Bromus tectorum (a)	-	-	_b 296	_a 250	-	-	89	84	9.67	5.96
G	Koeleria cristata	-	2	-	2	-	2	-	1	-	.03
G	Poa fendleriana	-	-	4	-	-	-	3	-	.04	-
G	Poa pratensis	-	4	3	3	-	2	1	1	.03	.03
G	Poa secunda	244	252	197	249	93	89	66	88	7.83	7.89
То	otal for Annual Grasses	0	0	306	264	0	0	94	90	9.72	6.06
To	otal for Perennial Grasses	511	563	436	498	187	193	155	174	17.61	25.82
To	otal for Grasses	511	563	742	762	187	193	249	264	27.33	31.88

T y	Species	Nested	Freque	ncy		Quadra	at Freque	ency		Average Cover %	
p e		'84	'90	'96	'01	'84	'90	'96	'01	'96	'01
F	Achillea millefolium	_b 175	_b 133	_a 69	_a 65	62	58	34	30	.82	1.52
F	Agoseris glauca	-	1	-	6	-	1	-	2	-	.04
F	Alyssum alyssoides (a)	-	-	_a 64	_b 95	-	-	26	41	.42	.30
F	Arabis spp.	-	6	8	2	-	3	3	1	.01	.00
F	Artemisia ludoviciana	15	20	21	23	5	7	7	8	2.30	1.77
F	Balsamorhiza sagittata	_b 60	_b 61	_a 26	_a 19	34	31	13	9	.77	.60
F	Calochortus nuttallii	-	3	-	-	-	1	-	-	-	-
F	Cirsium undulatum	10	19	5	13	5	9	4	6	.19	.71
F	Collomia linearis (a)	-	-	a-	_b 15	-	-	-	7	-	.03
F	Comandra pallida	-	-	-	1	-	-	=	1	-	.00
F	Collinsia parviflora (a)	-	-	50	66	-	-	20	28	.15	.16
F	Crepis acuminata	a-	_c 153	_b 28	_b 18	-	72	18	9	.34	.45
F	Cymopterus spp.	a-	a-	_a 2	_b 21	-	-	1	9	.00	.40
F	Draba spp. (a)	-	-	a-	_b 21	-	-	-	7	-	.03
F	Epilobium brachycarpum (a)	-	-	_b 83	_a 11	-	-	35	6	.93	.03
F	Erodium cicutarium (a)	-	-	_a 52	ь132	-	-	23	38	.65	7.74
F	Eriogonum umbellatum	_b 20	_b 12	_{ab} 7	a-	9	6	3	ı	.33	1
F	Hackelia patens	_b 27	_{ab} 15	_b 33	_a 7	12	9	16	2	.33	.07
F	Holosteum umbellatum (a)	-	-	_a 12	_b 168	-	-	6	61	.03	.65
F	Isatis tinctoria	-	-	-	1	-	-	-	1	-	.15
F	Lappula occidentalis (a)	-	-	-	1	-	-	-	1	-	.03
F	Lactuca serriola	-	-	16	19	-	-	7	8	.03	.07
F	Lomatium grayi	-	1	-	1	-	1	-	1	-	.03
F	Lupinus argenteus	_c 58	_b 34	_a 12	_a 11	34	18	6	5	.34	.39
F	Microsteris gracilis (a)	-	-	-	4	-	-	-	2	-	.01
F	Penstemon humilis	13	12	4	4	7	5	2	4	.06	.24
F	Phacelia spp.	a-	a ⁻	_{ab} 12	_b 10	-	-	4	5	.48	.12
F	Ranunculus testiculatus (a)	-	-	_b 23	_a 13	-	-	10	5	.07	.05
F	Senecio multilobatus	_d 80	a ⁻	a ⁻	a-	44	-	-	-	-	-
F	Sisymbrium altissimum (a)	-	-	12	-	-	-	7	-	.09	-
F	Tragopogon dubius	2		2	3	2		2	2	.01	.06
T	otal for Annual Forbs	0	0	296	526	0	0	127	196	2.36	9.05
T	otal for Perennial Forbs	460	470	245	224	214	221	120	103	6.05	6.67
T	otal for Forbs	460	470	541	750	214	221	247	299	8.41	15.72

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --

Herd unit 02, Study no: 13

T y p	Species	Strip Freque	ncy	Average Cover %	
e		'96	'01	'96	'01
В	Amelanchier alnifolia	9	7	.06	.03
В	Artemisia tridentata vaseyana	14	6	1.30	.36
В	Chrysothamnus viscidiflorus viscidiflorus	17	16	1.79	1.27
В	Eriogonum heracleoides	0	1	-	-
В	Mahonia repens	15	19	.07	.67
В	Prunus virginiana	5	4	.03	.03
В	Purshia tridentata	3	3	.38	1.00
В	Rosa woodsii	12	16	.72	.51
В	Sambucus cerulea	0	2	-	.03
В	Symphoricarpos oreophilus	6	4	1.31	1.62
Т	otal for Browse	81	78	5.68	5.55

BASIC COVER --

Herd unit 02, Study no: 13

Cover Type	Nested Frequen	cy	Average	Cover %)	
	'96	'01	'84	'90	'96	'01
Vegetation	368	374	1.75	16.25	43.72	48.98
Rock	326	319	17.50	20.50	25.35	30.16
Pavement	212	211	2.25	.75	5.00	4.30
Litter	389	357	66.75	44.50	45.87	33.00
Cryptogams	83	82	6.50	1.25	1.18	1.94
Bare Ground	180	136	5.25	16.75	7.04	4.88

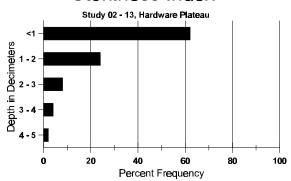
SOIL ANALYSIS DATA --

Herd Unit 02, Study no: 13, Hardware Plateau

Effective rooting depth (in)	Temp °F (depth)	РН	%sand	%silt	%clay	%0M	PPM P	РРМ К	dS/m
9.9	73.8 (10.1)	6.7	42.3	31.7	26.0	4.0	34.0	307.2	.5

416

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 02, Study no: 13

Туре	Quadra Freque	
	'96	'01
Rabbit	-	6
Elk	7	3
Deer	18	19

Pellet T	ransect
Pellet Groups per Acre	Days Use per Acre (ha) Ø1
226	N/A
165	13 (31)
505	39 (96)

BROWSE CHARACTERISTICS --

Herd unit 02, Study no: 13

_	Y	Form C			Plants)					Vigor C	lass			Plants	Average		Total
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	84	5	-	-	-	-	-	-	-	-	5	-	-	-	166			5
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96 01	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0 0
Y	84	-	8	1	-	-	-	-	-	-	9	-	-	-	300			9
	90	-	2	6	3	1	1	-	-	-	10	2	-	1	433			13
	96	6	5	1	-	-	-	-	-	-	12	-	-	-	240			12
Н	01	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33	27	22	1
	90 96	-	3	7	-	-	-	-	-	-	10	-	-	-	200	- 17	21	0 10
	01	3	2	2	-	-	-	-	-	-	7	-	-	-	140		21	7
	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	2	-	2	-	-	-	-	4	-	-	-	133			4
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		'90 '96		29% 36%			53% 36%			06 00						-22% -64%		
		'01		38%			25%			00					•	-04%		
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1(nai i	rants/A0	ne (ex	ciuain	g Dea	u & 50	eann;	gs)					'9(566			23%
													'96		440			0%
													'01		160			0%

A G	Y R	Form Cla	ass (N	lo. of I	Plants)					Vigor C	lass			Plants Per Acre	Average (inches)		Total
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Aı	rtem	isia trider	ıtata v	aseyaı	na													
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	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	01	1	-	-	-	-	-	-	-	-	1	-	-	-	20			l
M	84	1	2	-	-	-	-	-	-	-	3	-	-	-	100		9	3
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33	13	13	1
	96	-	7	2	-	-	-	-	-	-	9	-	-	-	180	24	34	
	01	1	1	-	-	-	-	-	-	-	1	1	-	-	40	32	37	2
D	84	1	1	5	-	-	-	-	-	-	7	-	-	-	233			7
	90	-	-	3	-	-	-	-	-	-	3	-	-	-	100			3 3 3
	96	-	3	-	-	-	-	-	-	-	2	-	-	1	60			3
	01	-	3	-	-	-	-	-	-	-	3	-	-	-	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
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		'90		00%			75%				5%					+53%		
		'96		71%			14%				¹ %				•	-57%		
		'01		67%	0		00%	0		00	J% ₀							
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<u>۱</u> `	1		-3 (3/1		o			<i>5~)</i>					'90		133	200	-	75%
													'96		280			21%
													'01		120			50%

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96			3	-	_	_	-	-	-	-	-	3	-	_	-	100			3
01			1	-	-	-	-	-	-	-	-	1	-	-	-				1
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% Plants Showing Moderate Use Heavy Use 190 Over			-	-	-	-	-	-	-	-	-	-	-	-	-	_			
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190 08% 00% 00% 12%	% Pla	ants Si		g			Use			<u>se</u>									
12% 12%																			
Total Plants/Acre (excluding Dead & Seedlings)																			
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Yel	Total	Гіанц	S/ACI	e (exi	ciudin	g Dea	u & St	eami	gs)								Dec.		
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90	Eriog	gonum	herac	leoid	les														
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		'84			1%		00%)%							
		'90			1%		00%)%							
	'96 '01				78% 00% 00% 00%							0%			-78%			
		'0	l	00	1%		00%	0		00)%							
Total Plants/Acre (excluding Dead & Seedlings)													'84		0	Dec	:	_
			`		-			- /					'90		0			-
													'96		460			-]
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